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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/677,006

09/30/2003

Wei Gao

SLA0805

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05/16/2006

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EXAMINER

LOKE, STEVEN HO YIN

ART UNIT

PAPER NUMBER

2811

DATE MAILED: 05/16/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/677,006	GAO ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Steven Loke	2811	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 28 February 2006.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-9 and 12 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 12 is/are allowed.
- 6) ☒ Claim(s) 1-7 is/are rejected.
- 7) ☒ Claim(s) 8 and 9 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                                   | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)               | Paper No(s)/Mail Date. _____  |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>9/30/03</u> .   | 6) <input type="checkbox"/> Other: _____                                    |

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1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claim 1 is rejected under 35 U.S.C. 102(b) as being clearly anticipated by Saito et al.

Saito et al. show all the elements of the claimed invention in fig. 1. It is a MOSFET gate structure, comprising: a gate dielectric (paragraph [0020]) overlying a substrate (it is inherent that a gate dielectric overlying a substrate because the gate dielectric is always supported by a substrate which has source and drain regions); a predominantly niobium monoxide gate (NbO in paragraph [0027]) (paragraphs [0011] and [0027] disclose NbO is used to induct hydrogen ion). Therefore, NbO is considered as a gate and NbO is overlying the gate dielectric (See also the abstract).

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al.

In regards to claim 2, Saito et al. differ from the claimed invention by not showing the predominantly niobium monoxide gate has a work function between approximately 4.1 eV and 4.4 eV.

It would have been obvious for the predominantly niobium monoxide gate has a work function between approximately 4.1 eV and 4.4 eV because it depends on the desired sensitivity of the hydrogen detector.

It would have been obvious to one having ordinary skill in the art at the time the invention was made for the predominantly niobium monoxide gate has a work function between approximately 4.1 eV and 4.4 eV, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

5. Claims 3, 6 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al. in view of Esashi.

In regards to claim 3, Saito et al. differ from the claimed invention by not showing the gate dielectric is silicon dioxide.

Esashi shows the gate dielectric [3] is silicon dioxide (see the abstract and fig. 1).

Since both Saito et al. and Esashi teach a gate dielectric for a FET type hydrogen sensor, it would have been obvious to have the silicon dioxide of Esashi in Saito et al. because it is a widely used gate dielectric material in a MOSFET type device.

In regards to claim 6, Saito et al. differ from the claimed invention by not showing a capping layer overlying the niobium monoxide gate.

Esashi shows a capping layer ([3] formed on top of electrode [1]) overlying the gate [1] in fig. 1.

Since both Saito et al. and Esashi teach a MOSFET type hydrogen sensor, it would have been obvious to have the capping layer of Esashi in Saito et al. because it protects the gate electrode.

In regards to claim 7, the combined device differs from the claimed invention by not showing the capping layer is silicon nitride.

It would have been obvious for the capping layer is silicon nitride, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use. In re Leshin, 125 USPQ 416.

6. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al. in view of Suzuki.

In regards to claim 4, Saito et al. differ from the claimed invention by not showing the gate dielectric comprises a high-k gate dielectric material.

Suzuki discloses the gate dielectric [4] comprises a high-k gate dielectric material (col. 3, lines 25-64).

Since both Saito et al. Suzuki teach a gate dielectric for a FET type hydrogen gas sensor, it would have been obvious to have the high-k gate dielectric material of Suzuki in Saito et al. because it increases the sensitivity of the hydrogen sensor.

7. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al. in view of Suzuki, further in view of Ma.

In regards to claim 5, Suzuki differs from the claimed invention by not showing the high-k gate dielectric material comprises  $\text{HfO}_2$ ,  $\text{ZrO}_2$ ,  $\text{Al}_2\text{O}_3$ ,  $\text{Ta}_2\text{O}_5$ ,  $\text{HfAlO}$  or  $\text{HfSiO}_4$ .

Ma teaches the high-k gate dielectric comprises  $\text{Ta}_2\text{O}_5$  in the Abstract.

Since both the combined device and Ma teach a gate dielectric in a MOSFET, it would have been obvious to have the Ta<sub>2</sub>O<sub>5</sub> of Ma in Suzuki because it is a widely used high-k dielectric material.

8. Applicant's arguments filed 2/28/06 have been fully considered but they are not persuasive.

It is urged, in pages 4 and 5 of the remarks, that Saito's paragraph [0011] never explicitly describes niobium oxide (in any form) as a transistor gate. However, Saito's paragraph [0011] does disclose the hydrogen ion electrode covered the gate dielectric film front face. In addition, Saito's paragraph [0013] further discloses using niobium oxide (Nb<sub>2</sub>O<sub>5</sub>) as a hydrogen ion induction ingredient. The abstract also discloses the niobium oxide thin film on a gate insulating film of an electric field effect type transistor FET is used to display the hydrogen ion concentration speedily in the form of voltage. Therefore, Saito does disclose niobium oxide as a transistor gate on a gate insulating film of a FET sensing device.

It is urged, in page 5 of the remarks, that Saito's paragraph [0020] discloses Nb<sub>2</sub>O<sub>5</sub> formed on a gate dielectric and on a gate. Since Saito also discloses the Nb<sub>2</sub>O<sub>5</sub> is formed on the metallic surface of a FET (paragraph [0011]), it is believed that the Nb<sub>2</sub>O<sub>5</sub> is formed on a metallic gate which formed on a gate dielectric.

It is urged, in page 5 of the remarks, that Saito's paragraph [0027] never discloses which example is using NbO. In addition, it never discloses NbO is used as a transistor gate. However, as mentioned in the previous arguments, Nb<sub>2</sub>O<sub>5</sub> is acting as a gate

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and formed on a gate insulating film of the FET sensing device. Therefore, NbO can replace Nb<sub>2</sub>O<sub>5</sub> as a gate of a FET.

It is urged, in pages 5 and 6 of the remarks, that it is incorrect to refer to the niobium oxide part of the "hydrogen ion electrode" combination as a gate electrode. Saito appears to differentiate between the gate and hydrogen ion sensor components. However, Saito's paragraph [0013] discloses Nb<sub>2</sub>O<sub>5</sub> as a hydrogen ion induction ingredient and the abstract discloses niobium oxide is used to display hydrogen ion concentration speedily in the form of voltage, the Nb<sub>2</sub>O<sub>5</sub> or NbO is used to activate the conductive gate to create a channel in a FET. Therefore, Nb<sub>2</sub>O<sub>5</sub> or NbO becomes a part of the gate structure in the FET sensing device. Saito et al. show all the limitations as claimed in claim 1.

It is urged, in pages 5 and 6 of the remarks, that Saito does not meet the three requirements to establish a prima facie case of obviousness. Since the preceding arguments disclose Nb<sub>2</sub>O<sub>5</sub> or NbO is used to activate the conductive gate of a FET, NbO become a part of the gate structure in the FET sensing device. It is believed that all three prima facie requirements have been meet. Therefore, it would have been obvious for Saito et al. to have the work function as claimed in claim 2.

It is urged, in pages 7 and 8 of the remarks, that Saito and Esashi do not meet the three requirements to establish a prima facie case of obviousness. However, Saito discloses NbO is used to activate the conductive gate of a FET. Therefore, NbO become a part of the gate structure in the FET sensing device. The combined device of Saito and Esashi meets all three prima facie requirements.

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It is urged, in pages 8 and 9 of the remarks, that Saito and Suzuki do not meet the three requirements to establish a prima facie case of obviousness. However, Saito discloses NbO is used to activate the conductive gate of a FET. Therefore, NbO become a part of the gate structure in the FET sensing device. The combined device of Saito and Suzuki meets all three prima facie requirements.

It is urged, in pages 9 and 10 of the remarks, that Saito, Suzuki and Ma do not meet the three requirements to establish a prima facie case of obviousness. However, Saito discloses NbO is used to activate the conductive gate of a FET. Therefore, NbO become a part of the gate structure in the FET sensing device. The combined device of Saito, Suzuki and Ma meets all three prima facie requirements.

9. Claim 12 is allowed.

10. Claims 8 and 9 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

11. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of



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the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Steven Loke whose telephone number is (571) 272-1657. The examiner can normally be reached on 8:00 am to 5:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie Lee can be reached on (571) 272-1732. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

sl  
May 11, 2006

Steven Loke  
Primary Examiner  
